

Claims

1. A back-light device for shedding light on the back of a liquid-crystal panel, the back-light device comprising:

a light-guiding plate being in the shape of a rectangular plate, part of one of its side surfaces, each facing in a direction perpendicular to the directions of its thickness, being formed as an incident surface to allow light to enter, and one of its top and bottom surfaces in the directions of its thickness being formed as a light-radiating surface;

a flexible PCB (printed circuit board) attached to part of the light-guiding plate in the vicinity of the incident surface;

light sources being installed on the flexible PCB, each of them having a light-radiating surface, which is put in close contact with the incident surface of the light-guiding plate; and

a frame housing and holding the light-guiding plate and the flexible PCB,

wherein the frame has a supporting wall on which the light-guiding plate is put, a window provided in the supporting wall and through which the light-radiating surface of the light-guiding plate is seen, and erected walls which are erected at the periphery of the supporting wall;

wherein the flexible PCB has a PCB part on which the light sources are installed and erected parts which are erected on

the far side of the PCB part away from the incident surface of the light-guiding plate; and

wherein the light-guiding plate is positioned with respect to the frame in the direction defined between the incident surface and the side surface facing in a direction perpendicular to the directions of the thickness of the light-guiding plate and being opposite to the incident surface by its side surface opposite to its incident surface being in contact with an erected wall of the frame and the erected parts of the flexible PCB being in contact with another erected wall of the frame.

2. A liquid crystal display comprising a liquid-crystal panel and a back-light device for shedding light on the back of the liquid-crystal panel, the back-light device comprising:

a light-guiding plate being in the shape of a rectangular plate, part of one of its side surfaces, each facing in a direction perpendicular to the directions of its thickness, being formed as an incident surface to allow light to enter, and one of its top and bottom surfaces in the directions of its thickness being a light-radiating surface;

a flexible PCB being attached to part of the light-guiding plate in the vicinity of the incident surface;

light sources being installed on the flexible PCB, each of them having a light-radiating surface, which is put in close contact with the incident surface of the light-guiding plate; and

a frame housing and holding the light-guiding plate and

the flexible PCB,

wherein the frame has a supporting wall on which the light-guiding plate is put, a window provided in the supporting wall and through which the light-radiating surface of the light-guiding plate is seen, and erected walls which are erected at the periphery of the supporting wall;

wherein the flexible PCB has a PCB part on which the light sources are installed and erected parts which are erected on the far side of the PCB part away from the incident surface of the light-guiding plate; and

wherein the light-guiding plate is positioned with respect to the frame in the direction defined between the incident surface and the side surface facing in a direction perpendicular to the directions of the thickness of the light-guiding plate and being opposite to the incident surface by its side surface opposite to its incident surface being in contact with an erected wall of the frame and the erected parts of the flexible PCB being in contact with another erected wall of the frame.

3. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein the light-radiating surface of the light source is pressed to the incident surface of the light-guiding plate by the erected parts.

4. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein electronic parts whose terminals are exposed are installed on the PCB part in the vicinity of the erected part of the flexible PCB.

5. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein the heat of the light source is conducted to the erected wall of the frame through the erected part of the flexible PCB.

6. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein a copper-foil pattern is formed on a front surface or a back surface of the erected part of the flexible PCB.

7. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein a copper-foil pattern is formed in the middle portion of the erected part of the flexible PCB in the directions of its thickness.

8. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein a reflecting material reflecting light to the incident surface of the light-guiding plate is provided on the surface of the erected part of the flexible PCB facing the light source.

9. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein the flexible PCB is pasted onto one surface or the other surface of the light-guiding plate in the directions of its thickness.

10. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein electronic parts are installed on a surface of the erected part opposite to its surface being in contact with the erected wall of the frame.

11. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein the light-guiding

plate is in the shape of a rectangular plate and has the incident surface, a first side surface opposite to the incident surface, and second and third side surfaces opposite to each other between the incident surface and the first side surface,

wherein the supporting wall of the frame is rectangular as seen from above;

wherein the frame has first to fourth erected walls which are erected on the four sides of the supporting wall, the first and second erected walls facing each other and the third and fourth erected walls facing each other;

wherein the light-guiding plate is positioned with respect to the frame in a direction perpendicular to the direction defined between the incident surface and the first side surface by the first side surface being in contact with the second erected wall, the second and third side surfaces being in contact with the third and fourth erected walls, and the second and third side surfaces being in contact with the third and forth erected walls.

12. A back-light device according to claim 1 or a liquid crystal display according to claim 2, wherein the frame comprises a front frame having the supporting wall, a window, and erected walls and a rear frame covering the light-guiding plate and flexible PCB from the other surface of the light-guiding plate in the directions of its thickness and being joined to the front frame.

13. A back-light device according to claim 1 or a liquid

crystal display according to claim 2, wherein while the side surface of the light-guiding plate being opposite to the incident surface is in contact with the erected wall of the frame and the flat flexible PCB and the light-guiding plate are fitted into the frame, the width of the erected parts of the flexible PCB is so determined that they are bent with respect to the PCB part by the erected wall of the frame and press the light-radiating surface of the light source to the incident surface of the light-guiding plate.